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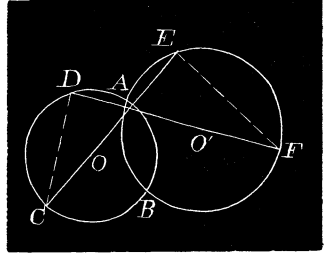
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Connect by straight lines the points D and C , and E and F . Then the triangles CDA and AED are right triangles, being inscribed in a semi-circle. The two triangles are also similar, having the acute angle EAF of the one equal to the acute angle DAC of the other.

$\therefore CA : AF :: AD : AE$, the homologous sides of similar triangles being proportional.

$\therefore CA \times AE = AF \times AD$. Q. E. D.

Remark.—When the angle CAF is a right angle AE and AD each equal zero. When the angle CAF is less than a right angle, the point E will fall on the semi-circumference ABF and the point D will fall on the diameter AF and $CA \times AE = AF \times AD$ as before.



Also solved by J. F. W. SCHEFFER, JOSIAH H. DRUMMOND, ROBERT J. ALEY, G. B. M. ZERR, J. A. CALDERHEAD, P. S. BERG, and P. H. PHILBRICK.

19. Proposed by ERIC DOOLITTLE, Instructor in Mathematics, State University of Iowa, Iowa City.

If MN be any plane, and A and B any points without the plane, to find a point P , in the plane, such that $AP + PB$ shall be a minimum.

Solution by THADDEUS MERRIMAN, South Bethlehem, Pennsylvania.

First, suppose the points to be on opposite sides of the plane; the point where the straight line joining the given points pierces the plane is the required point P ; since a straight line is the shortest distance between two points.

Second, suppose the points to be on the same side of the plane; let AB be the straight line joining them, CD the projection of AB on the plane MN , and AC the perpendicular which projects A on the plane. Now, produce AC to E making $AC = CE$, and join E and B ; the point P where EB cuts CD is the required point. For, join A and P , and let Q be any other point in the plane; join A and Q , and B and Q , also Q and E . Now, since $AC = CE$ by construction, $AP = PE$ and $AQ = QE$; consequently $BQ + QE = BQ + QA$, and therefore, since $BE < BQ + QE$, we have $AP + PB < AQ + QB$, or $AP + PB$ is a minimum.

[This demonstration is by Thaddeus Merriman, the 17 year old son of Professor Mansfield Merriman.—Ed.]

Also solved by J. H. BEACH, G. B. M. ZERR, LEONARD E. DICKSON, F. A. SWANGER, H. C. WHITAKER, P. H. PHILBRICK, A. H. BELL and J. F. W. SCHEFFER.

PROBLEMS.

31. Proposed by Professor G. I. Hopkins, Manchester, New Hampshire.

A field is bounded as follows: N. 14° W. 15.2 chains; N. $70^\circ 30'$ E. 20.43 chains; S. 6° E. 22.79 chains; N. $86^\circ 30'$ W. 18 chains. A spring within it bears from the second corner S. 75° E. 7.9 chains. It is required to cut off 10 acres from the west side of the field by a straight fence through the spring. How far will it be from the first corner to the point at which the division fence meets the fourth side?